March 28, 1978

Studies of Residues of Parathion and Guthion on Peach Foliage at the Time of Expiration of the Worker Safety Intervals in San Joaquin and Stanislaus Counties in California in June 1977

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SUMMARY

This study was initiated to determine the average residue level found at the time of worker safety interval expiration on peaches. The data found will be used for evaluations of worker hazards at harvest. During the week of June 20-23, 1977, leaf samples were taken from peach orchards on the day of, or within two days of, the worker safety interval expiration after treatment with Guthion or parathion. A total of 13 peach orchards were screened. The combinations of application techniques and rates for Guthion resulted in a wide range of residues, from 201 ppm to 124 ppm for surface residue and from 42.7 ppm to 201 ppm for total residue. The parathion residues were surprisingly low ranging from 0 to .8 ppm for surface and 0.5 to 1.9 ppm for total residues. Additional studies are planned that may lead to an understanding of the range of foliar residues that are found following applications in field-use situations.

ACF-441

DISCUSSION

Residues of parathion and Guthion on peach foliage have in previous years been considered the cause of field worker poisonings at peach harvest time in the central valley of California. The parathion poisonings were found to have occurred after heavy applications of parathion which are no longer applied.

Guthion poisonings of peach pickers were reported in this central valley area in 1967. Two reentry studies in 1970 (by Chemagro) involving exposure of citrus pickers 7 days after application of 4-1/2 pounds of actual Guthion acre resulted in significant cholinesterase depressions.

A reentry study (by UCD) in 1974 and another one in 1975 (by UCD) that involved exposure of peach thinners 48 hours after application of 3 pounds per acre of active ingredients of Guthion resulted in plasma and red cell cholinesterase depressions in these workers.

This 1977 residue analysis study was conducted to determine the typical residue levels of parathion and Guthion at the time of the expiration of the safety intervals on peaches. (14 days for Guthion and 21 days for Parathion.) The data on residue is given in Table one. The data on the weather for the same time period is given in Table two.

There have been no reported field worker poisoning incidents in recent years involving peach pickers exposed to Guthion.

ANALYTICAL METHODS (EXTRACTION)

The procedure used for the extraction of dislodgeable, penetrated, and total residues from leaf punches was originally published by Gunther in "The Bulletin of Environmental Contamination and Toxicology," 9, 243-249, 1973. It has been documented several times in detail, with modifications that were made to accomodate the various pesticides and their metabolites that the Worker Health and Safety Unit has been concerned with.

The sample container and leaf punches are weighted and the gross weight recorded.

Total Residues

1. The leaf punches are transferred to a blending jar. The empty sample container is again weighted and the net weight of the punches recorded.

2. Approximately 50 gms of sodium sulfate and 100 mls of ethyl acetate are added.

3. The sample is blended at high speed for 3 minutes, keeping the blender cup cool by immersing it in a container of cool water. The blender cup is removed and the sample allowed to settle.

4. An aliquot is decanted into a teflon-capped bottle and stored in the freezer prior to cleanup and analysis.

Dislodgeable Residues

1. Fifty mls of water and approximately 4 drops of Sur-Ten solution (1:50) are added to the sample containers. The containers are capped, placed in a multi-purpose rotator and rotated at 30 cycles/min for 60 min. The aqueous solution is decanted through a glass wool plug into a 500 ml separatory funnel.

2. The punches are rotated a second time, using 50 mls of water and 4 drops of Sur-Ten solution, for 30 min. This is added to the first extraction.

3. The sample is then hand-shaken for approximately 10 seconds with 30 mls of water. The container is drained into the separatory funnel with the first two extractions.

4. The aqueous solution is extracted three times with 50 ml of ethyl acetate. Roll separatory funnel 1-1/2-2 minutes. Shaking will cause emulsions. The solvent is filtered through sodium sulfate into a glass-stoppered mixing cylinder. An aliquot is decanted into a teflon-capped bottle and stored in the freezer prior to cleanup and analysis.

ANALYTICAL METHODS (CHROMATOGRAPHY)

GLC conditions:

Varian 2100, FPD detector, std. flows, 48 x 2 mm I.D. of 4% OV-101 (carbowax vapor - deposition treated) at 190° C.

Table 1

Residue levels found in 13 peach orchards at the expiration of worker safety intervals for Guthion (14 days) and Parathion (21 days). All applications were made by ground rigs except for field number four.

Field No.	Product Name	Concentration of Active Ingredient	Rate of Application	Amount of Active Ingredient Applied	Dilution of Spray	Date of Safety Interval Expiration	Date Samples Collected	Leaf Residues in PPM	
								Surface	Total
				Guthion					
1.	ND*	ND	ND	ND	ND	6-17	6-17	25.6	42.7
2.	ND	ND	ND	ND	ND	6-17	6-17	54.1	121.0
3.	Guthion 25	2 lbs/gal	5 pt/acre	1.25 lb/a	400 gal/acre	6-20	6-22	49.8	51.9
4.	Guthion 25	2 lbs/gal	6 pt/acre	1.5 lb/a	20 gal/acre	6-21	6-22	36.9	52.2
5.	Guthion 25	2 lbs/gal	5 pt/acre	1.25 lb/a	400 gal/acre	6-22	6-22	45.3	49.2
6.	Guthion 25	2 lbs/gal	6 pt/acre	1.5 lb/a	400 gal/acre	6-21/22	6-22	106.0	201.0
7.	Guthion 50W	50%	2 lbs/acre	1 lb/a	100 gal/acre	6-21/23	6-23	69.3	114.0
8.	Guthion 50W	50%	2 lbs/acre	1 lb/a	100 gal/acre	6-21/23	6-23	115.0	111.0
9.	Guthion 50W	50%	2 lbs/acre	1 lb/a	100 gal/acre	6-21/23	6-23	124.0	118.0
10.	Guthion 25	2 lbs/gal	5.25 pts/acre	1.3 lb/a	50 gal/acre	6-21/23	6-23	86.9	172.0
11.	Guthion 25	2 lbs/gal	5.25 pts/acre	1.3 lb/a	50 gal/acre	6-21/23	6-23	52.7	77.7
				Parathion					
12.	Phoskil 25	25%	8 lbs/acre	2 lbs/a	350 gal/acre	6-20	6-22	0.00	0.50
13.	Phoskil 25	25%	8 lbs/acre	1 lb/a	400 gal/acre	6-22	6-22	0.80	1.86

* ND = Not Determined

Table 2

Weather Conditions in Stanislaus and San Joaquin Counties for May and June, 1977

Stanislaus Co. (Modesto)

Date	Temperature		Precipitation	Date	Temperature		Precipitation
	Maximum	Minimum	(Inches)		Maximum	Minimum	(Inches)
5/15	74	47		6/5	100	65	
16	70	48		6	102	68	
17	74	45		7	98	72	
18	67	44	0.04	8	92	63	
19	78	50	0.01	9	75	59	
20	85	50		10	75	55	
21	82	48		11	84	52	
22	65	49		12	82	53	
23	68	52		13	76	53	
24	77	48		14	83	52	
25	75	50		15	88	52	
26	74	55		16	91	55	
27	76	48		17	81	55	
28	82	49		18	80	54	
29	83	48		19	87	55	
30	93	53		20	89	56	
31	98	55		21	99	63	
6/1	89	61		22	105	67	
2	87	53		23	98	63	
3	91	55		24	104	64	
4	95	59		25	102	66	
				Average	85.1	55.0	Total 0.05

San Joaquin Co. (Lodi)

Date	Temperature		Precipitation	Date	Temperature		Precipitation
	Maximum	Minimum	(Inches)		Maximum	Minimum	(Inches)
5/15	71	45		6/5	98	60	
16	68	43		6	97	61	
17	75	48	0.02	7	98	65	
18	71	44	0.01	8	93	58	
19	78	47	0.03	9	84	56	
20	81	48		10	75	52	
21	81	49		11	79	49	
22	73	46	0.01	12	76	49	
23	70	50		13	76	51	
24	77	47		14	78	50	
25	72	47		15	85	49	
26	70	40	0.05	16	84	49	
27	75	43		17	76	54	
28	80	45		18	77	50	
29	84	48		19	82	50	
30	89	47		20	88	53	
31	93	57		21	97	52	
6/1	91	52		22	100	65	
2	85	49		23	98	58	
3	86	47		24	99	59	
4	92	54		25	96	56	
				Average	83.3	51.0	Total 0.12